

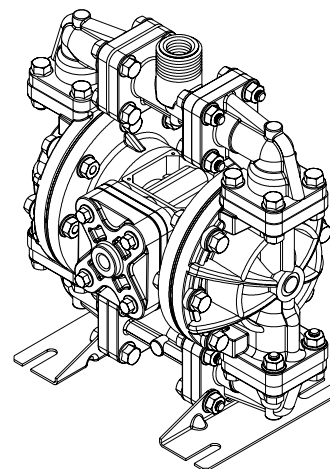
SERVICE & OPERATING MANUAL



Model S05 Conductive Acetal Design Level 2

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U.S. Patent #
400,210; 5,996,627;
6,241,487

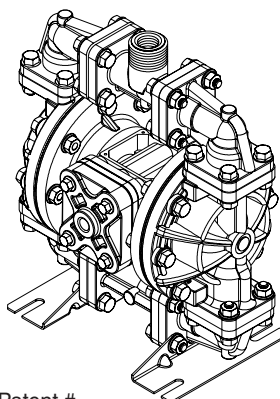
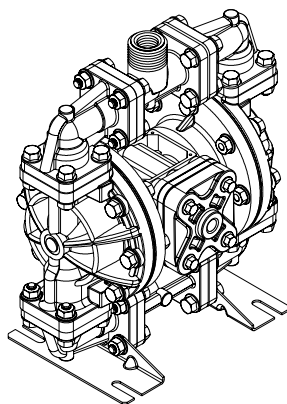


**WARREN
RUPP®**

Quality System
ISO9001 Certified

Environmental
Management System
ISO14001 Certified

IDEX
FLUID & METERING



Ex II 2GD T5

U.S. Patent #
5,996,627; 6,241,487
Other U.S. Patents
Applied for



SANDPIPER®
A WARREN RUPP PUMP BRAND

S05 Conductive Acetal Design Level 2 Ball Valve

**Air Operated
Double-Diaphragm Pump**

ENGINEERING, PERFORMANCE
& CONSTRUCTION DATA

INTAKE/DISCHARGE PIPE SIZE 1/2" NPT (Internal) or 1/2" BSPT (Tapered) 1" NPT (External) or 1" BSPT (Tapered)	CAPACITY 0 to 14 gallons per minute (0 to 52 liters per minute)	AIR VALVE No-lube, no-stall design	SOLIDS-HANDLING Up to .125 in. (3mm)	HEADS UP TO 100 psi or 231 ft. of water (7 Kg/cm ² or 70 meters)	DISPLACEMENT/STROKE .026 Gallon / .098 liter
⚠ CAUTION! Operating temperature limitations are as follows: MATERIALS					
				Operating Temperatures	
				Maximum*	Minimum*
Nitrile: General purpose, oil-resistant. Shows good solvent, oil, water and hydraulic fluid resistance. Should not be used with highly polar solvents like acetone and MEK, ozone, chlorinated hydrocarbons and nitro hydrocarbons.				190° F 88° C	-10° F -23° C
Conductive Acetal:				190° F 88° C	-20° F -29° C
Virgin PTFE: Chemically inert, virtually impervious. Very few chemicals are known to react chemically with PTFE- molten alkali metals, turbulent liquid or gaseous fluorine and a few fluoro-chemicals such as chlorine trifluoride or oxygen difluoride which readily liberate free fluorine at elevated temperatures.				220° F 104° C	-35° F -37° C
UHMW PE: High tensile material with excellent abrasion resistance. A general purpose material with excellent resistance to most oils.				180° F 82° C	-35° F -37° C
Santoprene®: Injection molded thermoplastic elastomer with no fabric layer. Long mechanical flex life. Excellent abrasion resistance.				275° F 135° C	-40° F -40° C

For specific applications, always consult the Warren Rupp "Chemical Resistance Chart"

SANDPIPER® pumps are designed to be powered only by compressed air.

Explanation of Pump Nomenclature

S05 Conductive Acetal · Design Level 2· Ball Valve

Model	Pump Brand	Pump Size	Check Valve Type	Design Level	Wetted Material	Diaphragm/Check Valve Materials	Check Valve Seat	Non-Wetted Material Options	Porting Options	Pump Style	Pump Options	Kit Options	Shipping Weight lbs. (kg)
S05B2G1TXNS000.	S	05	B	2	G	1	T	X	N	S	0	00.	17 (8)
S05B2G2TXNS000.	S	05	B	2	G	2	T	X	N	S	0	00.	17 (8)
S05B2GUTXNS000.	S	05	B	2	G	U	T	X	N	S	0	00.	17 (8)
S05B2G1TXBS000.	S	05	B	2	G	1	T	X	B	S	0	00.	17 (8)
S05B2G2TXBS000.	S	05	B	2	G	2	T	X	B	S	0	00.	17 (8)
S05B2GUTXBS000.	S	05	B	2	G	U	T	X	B	S	0	00.	17 (8)

Pump Brand
S= SANDPIPER®

Design Level
2=Design Level

Check Valve Seat
T= Virgin PTFE

Pump Style
S= Standard

Pump Size
05=1/2"

Wetted Material
G=Conductive Acetal

Non-Wetted Material Options
X= Non-painted Aluminum

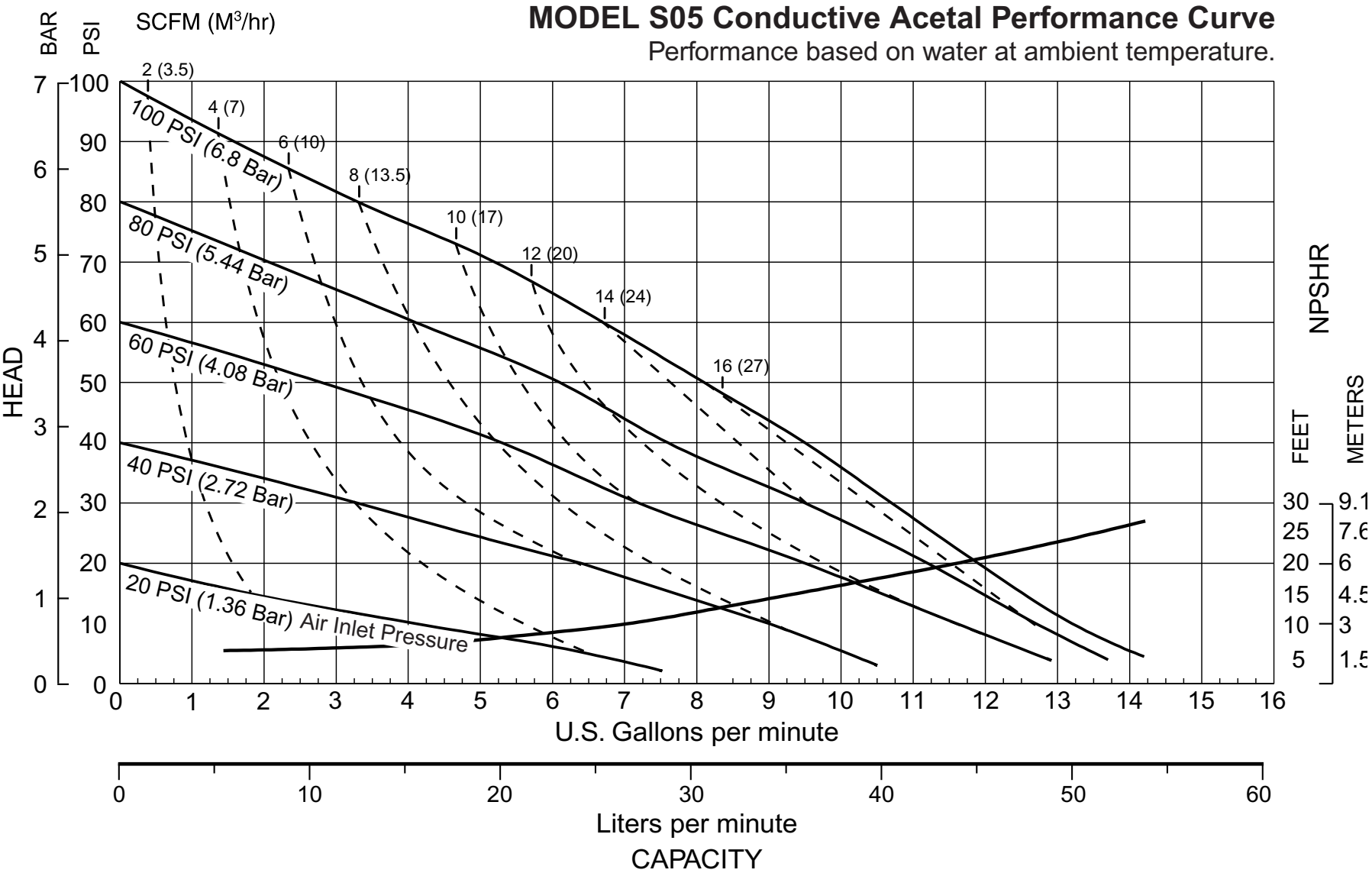
Pump Options
0= None
6= Metal Muffler

Check Valve Type
B= Soild Ball

Diaphragm/Check Valve Materials
1= Santoprene/Santoprene
2= Virgin PTFE-Santoprene Backup/Virgin PTFE
B= Nitrile/Nitrile
U= Polyurethane/Polyurethane

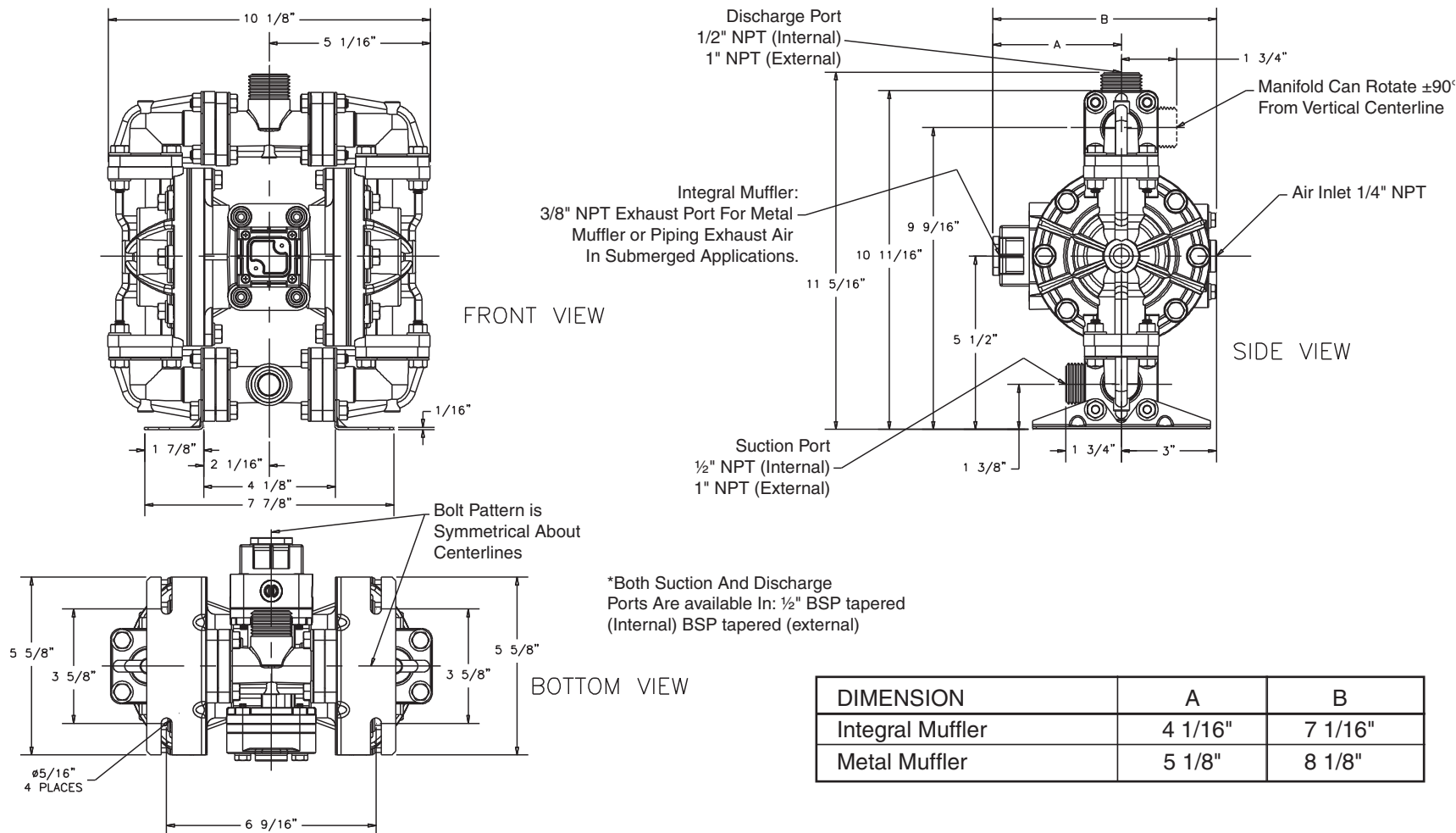
Porting Options
N= NPT Threads
B= BSPT (Tapered) Threads

Performance Curve, S05 Conductive Acetal Design Level 2



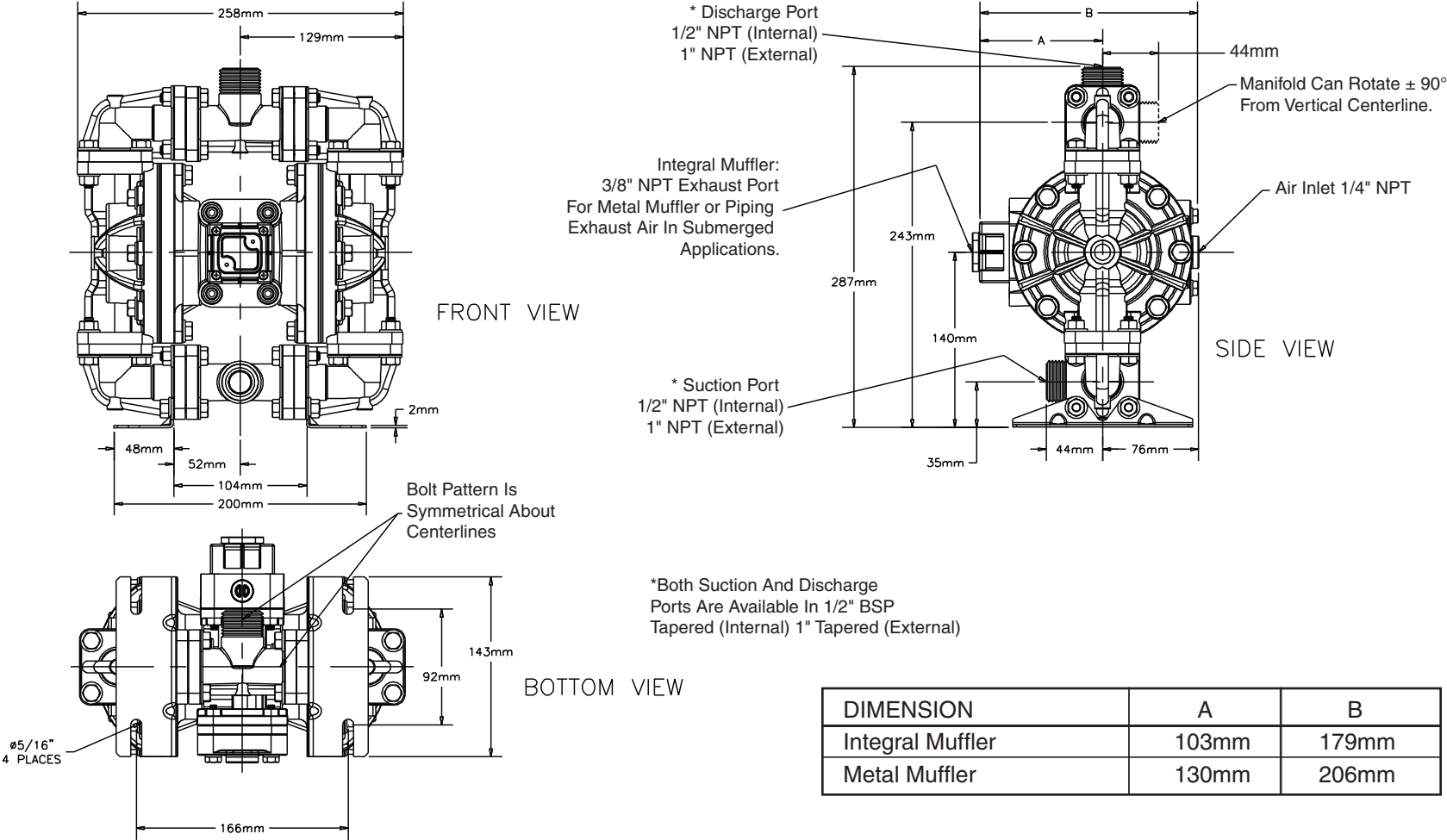
Dimensions: S05 Conductive Acetal

Dimensions in Inches
Dimensional tolerance: $\pm 1/8$ "



Metric Dimensions: S05 Conductive Acetal

Dimensions in millimeters
Dimensional tolerance: ±3mm



PRINCIPLE OF PUMP OPERATION

This ball type check valve pump is powered by compressed air and is a 1:1 ratio design. The inner side of one diaphragm chamber is alternately pressurized while simultaneously exhausting the other inner chamber. This causes the diaphragms, which are connected by a common rod secured by plates to the centers of the diaphragms, to move in a reciprocating action. (As one diaphragm performs the discharge stroke the other diaphragm is pulled to perform the suction stroke in the opposite chamber.) Air pressure is applied over the entire inner surface of the diaphragm while liquid is discharged from the opposite side of the diaphragm. The diaphragm operates in a balanced condition during the discharge stroke which allows the pump to be operated at discharge heads over 200 feet (61 meters) of water.

For maximum diaphragm life, keep the pump as close to the liquid being pumped as possible. Positive suction head in excess of 10 feet of liquid (3.048 meters) may require a back pressure regulating device to maximize diaphragm life.

Alternate pressurizing and exhausting of the diaphragm chamber is performed by an externally mounted, pilot operated, four way spool type air distribution valve. When the spool shifts to one end of the valve body, inlet pressure is applied to one diaphragm chamber and the other diaphragm chamber exhausts. When the spool shifts to the opposite end of the valve

body, the pressure to the chambers is reversed. The air distribution valve spool is moved by a internal pilot valve which alternately pressurizes one end of the air distribution valve spool while exhausting the other end. The pilot valve is shifted at each end of the diaphragm stroke when a actuator plunger is contacted by the diaphragm plate. This actuator plunger then pushes the end of the pilot valve spool into position to activate the air distribution valve.

The chambers are connected with manifolds with a suction and discharge check valve for each chamber, maintaining flow in one direction through the pump.

INSTALLATION AND START-UP

Locate the pump as close to the product being pumped as possible. Keep the suction line length and number of fittings to a minimum. Do not reduce the suction line diameter.

For installations of rigid piping, short sections of flexible hose should be installed between the pump and the piping. The flexible hose reduces vibration and strain to the pumping system. A Warren Rupp Tranquillizer® surge suppressor is recommended to further reduce pulsation in flow.

AIR SUPPLY

Air supply pressure cannot exceed 125 psi (8.6 bar). Connect the pump air inlet to an air supply of sufficient capacity and pressure required for desired performance. When the air supply line is solid piping, use a short length of flexible hose not less than

1/2" (13mm) in diameter between the pump and the piping to reduce strain to the piping. The weight of the air supply line, regulators and filters must be supported by some means other than the air inlet cap. Failure to provide support for the piping may result in damage to the pump. A pressure regulating valve should be installed to insure air supply pressure does not exceed recommended limits.

AIR VALVE LUBRICATION

The air distribution valve and the pilot valve are designed to operate WITHOUT lubrication. This is the preferred mode of operation. There may be instances of personal preference or poor quality air supplies when lubrication of the compressed air supply is required. The pump air system will operate with properly lubricated compressed air supply. Proper lubrication requires the use of an air line lubricator (available from Warren Rupp) set to deliver one drop of SAE 10 non-detergent oil for every 20 SCFM (9.4 liters/sec.) of air the pump consumes at the point of operation. Consult the pump's published Performance Curve to determine this.

AIR LINE MOISTURE

Water in the compressed air supply can create problems such as icing or freezing of the exhaust air, causing the pump to cycle erratically or stop operating. Water in the air supply can be reduced by using a point-of-use air dryer to supplement the user's air drying equipment. This device removes water from the compressed air supply

and alleviates the icing or freezing problems.

AIR INLET AND PRIMING

To start the pump, open the air valve approximately 1/2" to 3/4" turn. After the pump primes, the air valve can be opened to increase air flow as desired. If opening the valve increases cycling rate, but does not increase the rate of flow, cavitation has occurred. The valve should be closed slightly to obtain the most efficient air flow to pump flow ratio.

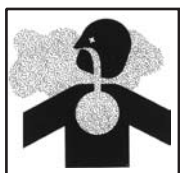
BETWEEN USES

When the pump is used for materials that tend to settle out or solidify when not in motion, the pump should be flushed after each use to prevent damage. (Product remaining in the pump between uses could dry out or settle out. This could cause problems with the diaphragms and check valves at restart.) In freezing temperatures the pump must be completely drained between uses in all cases.

INSTALLATION GUIDE Top Discharge Ball Valve Unit

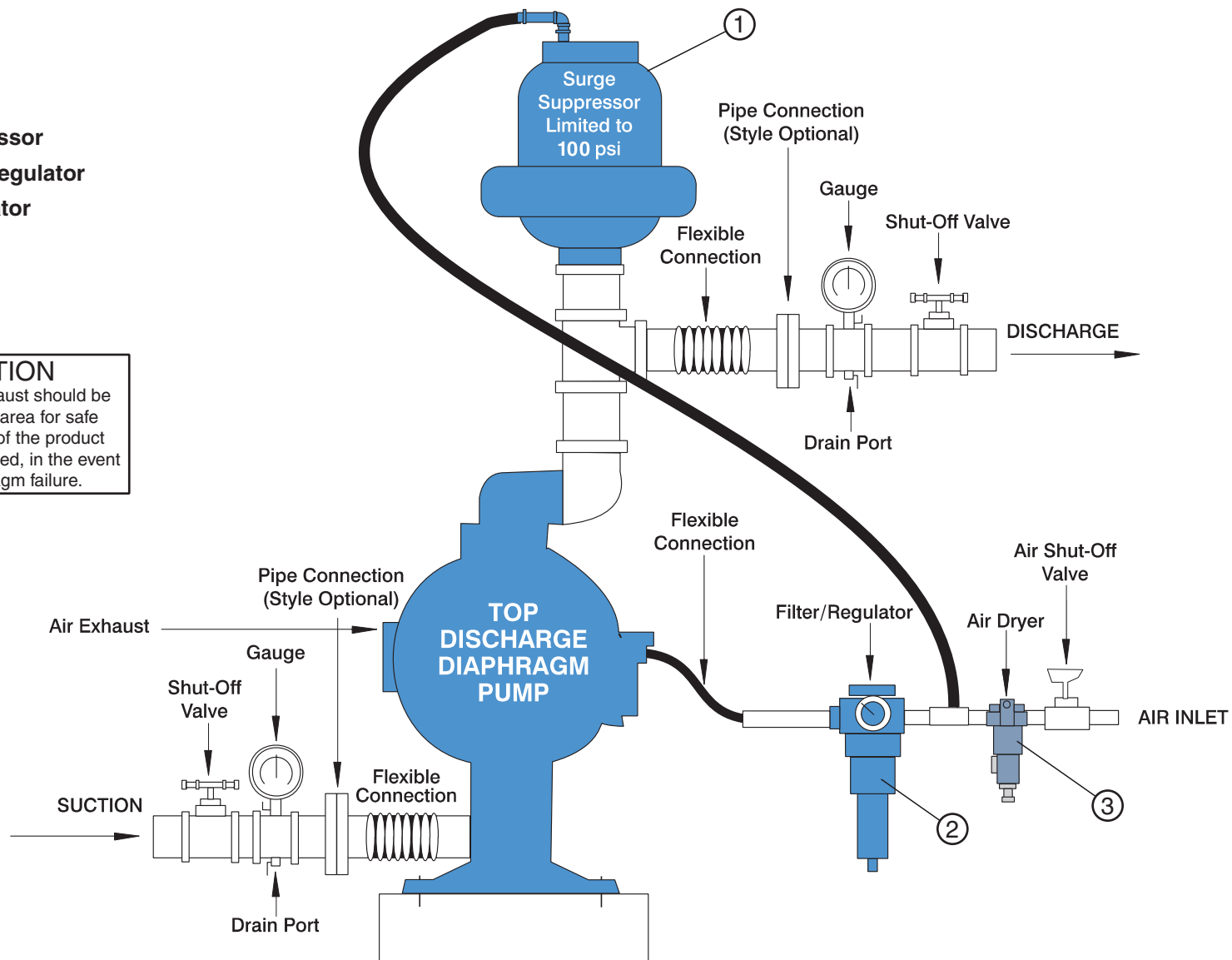
Available from
Warren Rupp

- ① DA05 Surge Suppressor
- ② 020-049-000 Filter/Regulator
- ③ 020-049-001 Lubricator



CAUTION

The air exhaust should be piped to an area for safe disposition of the product being pumped, in the event of a diaphragm failure.



TROUBLESHOOTING

Possible Symptoms:

- Pump will not cycle.
- Pump cycles, but produces no flow.
- Pump cycles, but flow rate is unsatisfactory.
- Pump cycle seems unbalanced.
- Pump cycle seems to produce excessive vibration.

What to Check: Excessive suction lift in system.

Corrective Action: For lifts exceeding 20 feet (6 meters), filling the pumping chambers with liquid will prime the pump in most cases.

What to Check: Excessive flooded suction in system.

Corrective Action: For flooded conditions exceeding 10 feet (3 meters) of liquid, install a back pressure device.

What to Check: System head exceeds air supply pressure.

Corrective Action: Increase the inlet air pressure to the pump. Most diaphragm pumps are designed for 1:1 pressure ratio at zero flow.

What to Check: Air supply pressure or volume exceeds system head.

Corrective Action: Decrease inlet air pressure and volume to the pump as calculated on the published PERFORMANCE CURVE. Pump is cavitating the fluid by fast cycling.

What to Check: Undersized suction line.

Corrective Action: Meet or exceed pump connection recommendations shown on the DIMENSIONAL DRAWING.

What to Check: Restricted or undersized air line.

Corrective Action: Install a larger air line and connection. Refer to air inlet recommendations shown in your pump's SERVICE MANUAL.

What to Check: Check ESADS, the Externally Serviceable Air Distribution System of the pump.

Corrective Action: Disassemble and inspect the main air distribution valve, pilot valve and pilot valve actuators. Refer to the parts drawing and air valve section of the SERVICE MANUAL. Check for clogged discharge or closed valve before reassembly.

What to Check: Rigid pipe connections to pump.

Corrective Action: Install flexible connectors and a Warren Rupp Tranquilizer® Surge Suppressor.

What to Check: Blocked air exhaust muffler.

Corrective Action: Remove muffler screen, clean or de-ice and reinstall. Refer to the Air Exhaust section of your pump SERVICE MANUAL.

What to Check: Pumped fluid in air exhaust muffler.

Corrective Action: Disassemble pump chambers. Inspect for diaphragm rupture or loose diaphragm plate assembly. Refer to the Diaphragm Replacement section of your pump SERVICE MANUAL.

What to Check: Suction side air leakage or air in product.

Corrective Action: Visually inspect all suction side gaskets and pipe connections.

What to Check: Obstructed check valve.

Corrective Action: Disassemble the wet end of the pump and manually dislodge obstruction in the check valve pocket. Refer to the Check Valve section of the pump SERVICE MANUAL for disassembly instructions.

What to Check: Worn or misaligned check valve or check valve seat.

Corrective Action: Inspect check valves and seats for wear and proper seating. Replace if necessary. Refer to Check Valve section of the pump SERVICE MANUAL for disassembly instructions.

What to Check: Blocked suction line.

Corrective Action: Remove or flush obstruction. Check and clear all suction screens and strainers.

What to Check: Blocked discharge line.

Corrective Action: Check for obstruction or closed discharge line valves.

What to Check: Blocked pumping chamber.

Corrective Action: Disassemble and inspect the wetted chambers of the pump. Remove or flush any obstructions. Refer to the pump SERVICE MANUAL for disassembly instructions.

What to Check: Entrained air or vapor lock in one or both pumping chambers.

Corrective Action: Purge chambers through tapped chamber vent plugs. PURGING THE CHAMBERS OF AIR CAN BE DANGEROUS! Contact the Warren Rupp Technical Services Department before performing this procedure. Any model with top-porting discharge will reduce or eliminate problems with entrained air.

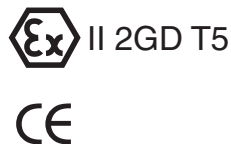
If your pump continues to perform below your expectations, contact your local Warren Rupp Distributor or factory Technical Services Group for a service evaluation.

WARRANTY

Refer to the enclosed Warren Rupp Warranty Certificate.

Recycling

Many components of SANDPIPER® Conductive Acetal AODD pumps are made of recyclable materials (see chart on page 10 for material specifications). We encourage pump users to recycle worn out parts and pumps whenever possible, after any hazardous pumped fluids are thoroughly flushed.



Pump complies with EN809 Pumping Directive, Directive 98/37/EC Safety of Machinery, and Directive 94/9/EC, EN13463-1 Equipment for use in Potentially Explosive Environments. For reference to the directive certificates visit: www.warrenrupp.com. The Technical File No. AX1 is stored at KEMA, Notified Body 0344, under Document #203040000.

Important Safety Information



! IMPORTANT

Read these safety warnings and instructions in this manual completely, before installation and start-up of the pump. It is the responsibility of the purchaser to retain this manual for reference. Failure to comply with the recommendations stated in this manual will damage the pump, and void factory warranty.



! CAUTION

Before pump operation, inspect all gasketed fasteners for looseness caused by gasket creep. Retorque loose fasteners to prevent leakage. Follow recommended torques stated in this manual.



! WARNING

Before maintenance or repair, shut off the compressed air line, bleed the pressure, and disconnect the air line from the pump. The discharge line may be pressurized and must be bled of its pressure.



! WARNING

In the event of diaphragm rupture, pumped material may enter the air end of the pump, and be discharged into the atmosphere. If pumping a product which is hazardous or toxic, the air exhaust must be piped to an appropriate area for safe disposition.



! WARNING

Take action to prevent static sparking. Fire or explosion can result, especially when handling flammable liquids. The pump, piping, valves, containers or other miscellaneous equipment must be grounded. (See Page 19)



! WARNING

This pump is pressurized internally with air pressure during operation. Always make certain that all bolting is in good condition and that all of the correct bolting is reinstalled during assembly.



! WARNING

When used for toxic or aggressive fluids, the pump should always be flushed clean prior to disassembly.



! WARNING

Before doing any maintenance on the pump, be certain all pressure is completely vented from the pump, suction, discharge, piping, and all other openings and connections. Be certain the air supply is locked out or made non-operational, so that it cannot be started while work is being done on the pump. Be certain that approved eye protection and protective clothing are worn all times in the vicinity of the pump. Failure to follow these recommendations may result in serious injury or death.



! WARNING

Airborne particles and loud noise hazards. Wear ear and eye protection.

Material Codes

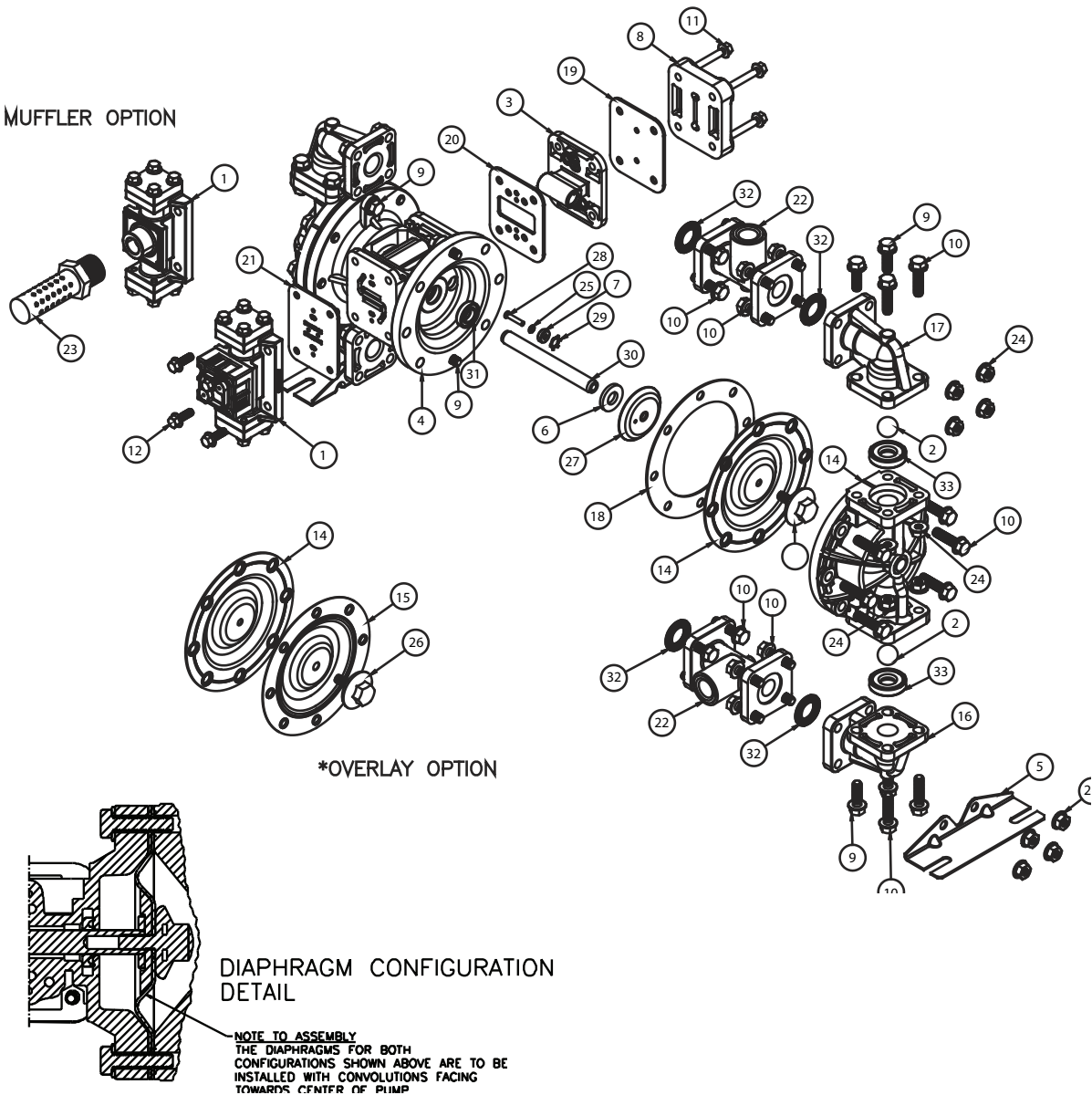
The Last 3 Digits of Part Number

000	Assembly, sub-assembly; and some purchased items	175	Die Cast Zinc	374	Carboxylated Nitrile	606	PTFE
010	Cast Iron	180	Copper Alloy	375	Fluorinated Nitrile	610	PTFE Encapsulated Silicon
012	Powered Metal	305	Carbon Steel, Black Epoxy Coated	378	High Density Polypropylene	611	PTFE Encapsulated FKM
015	Ductile Iron	306	Carbon Steel, Black PTFE Coated	405	Cellulose Fibre	632	Neoprene/Hytrel
020	Ferritic Malleable Iron	307	Aluminum, Black Epoxy Coated	408	Cork and Neoprene	633	FKM/PTFE
025	Music Wire	308	Stainless Steel, Black PTFE Coated	425	Compressed Fibre	634	EPDM/PTFE
080	Carbon Steel, AISI B-1112	309	Aluminum, Black PTFE Coated	426	Blue Gard	635	Neoprene/PTFE
100	Alloy 20	310	PVDF Coated	440	Vegetable Fibre	637	PTFE , FKM/PTFE
110	Alloy Type 316 Stainless Steel	330	Zinc Plated Steel	465	Fibre	638	PTFE , Hytrel/PTFE
111	Alloy Type 316 Stainless Steel (Electro Polished)	331	Chrome Plated Steel	500	Delrin 500	639	Buna-N/TFE
112	Alloy C	332	Aluminum, Electroless Nickel Plated	501	Delrin 570	643	Santoprene®/EPDM
113	Alloy Type 316 Stainless Steel (Hand Polished)	333	Carbon Steel, Electroless Nickel Plated	502	Conductive Acetal, ESD-800	644	Santoprene®/PTFE
114	303 Stainless Steel	335	Galvanized Steel	503	Conductive Acetal, Glass-Filled	656	Santoprene Diaphragm and Check Balls/EPDM Seats
115	302/304 Stainless Steel	336	Zinc Plated Yellow Brass	505	Acrylic Resin Plastic	661	EPDM/Santoprene
117	440-C Stainless Steel (Martensitic)	337	Silver Plated Steel	506	Delrin 150		
120	416 Stainless Steel (Wrought Martensitic)	340	Nickel Plated	520	Injection Molded PVDF Natural color		
123	410 Stainless Steel (Wrought Martensitic)	342	Filled Nylon	540	Nylon		
148	Hardcoat Anodized Aluminum	353	Geolast; Color: Black	541	Nylon		Delrin and Hytrel are registered tradenames of E.I. DuPont.
149	2024-T4 Aluminum	354	Injection Molded #203-40 Santoprene- Duro 40D +/-5; Color: RED	542	Nylon		Gylon is a registered tradename of Garlock, Inc.
150	6061-T6 Aluminum	355	Thermal Plastic	544	Nylon Injection Molded		Nylatron is a registered tradename of Polymer Corp.
151	6063-T6 Aluminum	356	Hytrel	550	Polyethylene		Santoprene is a registered tradename of Mon- santo Corp.
152	2024-T4 Aluminum (2023-T351)	357	Injection Molded Polyurethane	551	Glass Filled Polypropylene		Rulon II is a registered tradename of Dixon Industries Corp.
154	Almag 35 Aluminum	358	Urethane Rubber (Some Applications) (Compression Mold)	552	Unfilled Polypropylene		Ryton is a registered tradename of Phillips Chemical Co.
155	356-T6 Aluminum	359	Urethane Rubber	553	Unfilled Polypropylene		Valox is a registered tradename of General Electric Co.
156	356-T6 Aluminum	360	Nitrile Rubber. Color coded: RED	555	Polyvinyl Chloride		Warren Rupp, SANDPIPER, PortaPump, Tranquilizer and SludgeMaster are registered tradenames of Warren Rupp, Inc.
157	Die Cast Aluminum Alloy #380	361	FDA Accepted Nitrile	556	Black Vinyl		
158	Aluminum Alloy SR-319	363	FKM (Fluorocarbon). Color coded: YEL- LOW	570	Rulon II		
159	Anodized Aluminum	364	E.P.D.M. Rubber. Color coded: BLUE	580	Ryton		
162	Brass, Yellow, Screw Machine Stock	365	Neoprene Rubber. Color coded: GREEN	590	Valox		
165	Cast Bronze, 85-5-5-5	366	Food Grade Nitrile	591	Nylatron G-S		
166	Bronze, SAE 660	368	Food Grade EPDM	592	Nylatron NSB		
170	Bronze, Bearing Type, Oil Impregnated	370	Butyl Rubber. Color coded: BROWN	600	PTFE (virgin material) Tetrafluorocarbon (TFE)		
		371	Philthane (Tuftane)	601	PTFE (Bronze and moly filled)		
				602	Filled PTFE		
				603	Blue Gylon		
				604	PTFE		
				607	Envelon		

Composite Repair Parts Drawing

Available Service And Conversion Kits

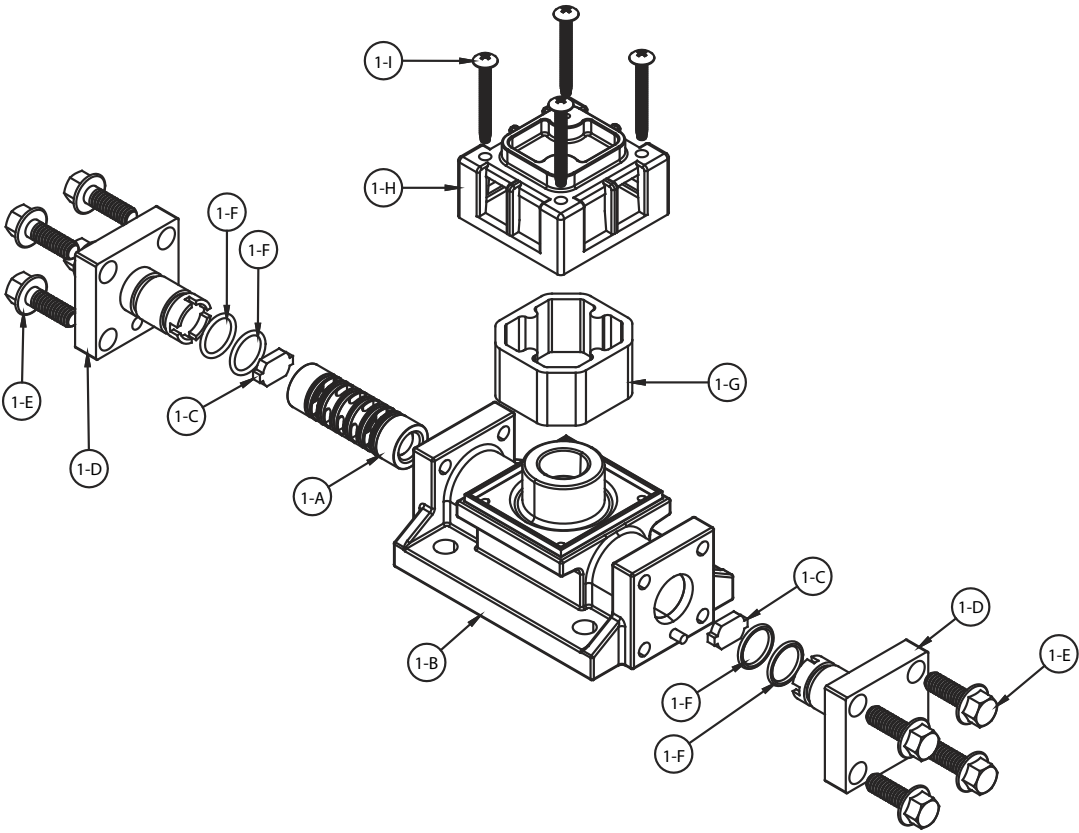
476-221-000	AIR END KIT Seals, O-ring, Gaskets, Retaining Rings, Air Valve Assembly, Pilot Valve Assembly
476-202-360	WET END KIT Nitrile Diaphragms, Nitrile Check Balls, PTFE Seats and PTFE Seals
476-202-354	WET END KIT Santoprene Diaphragms, Nitrile Spacer Gaskets, Santoprene Check Balls, PTFE Seats and PTFE Seals
476-202-357	WET END KIT Polyurethane Diaphragms, Nitrile Spacer Gaskets, Santoprene Check Balls, PTFE Seats and PTFE Seals
476-202-654	WET END KIT Santoprene Diaphragms, PTFE Overlay Diaphragm, PTFE Check Balls, PTFE Seats and PTFE Seals



Composite Repair Parts List

Item	Part Number	Description	Qty	Item	Part Number	Description	Qty
1	031-186-003	Air Valve Assembly	1	17	312-112-502	Elbow, Discharge	2
	031-191-001	Air Valve Assembly (with integral muffler)	1	18	360-099-360	Gasket, Spacer (Use w/TPE Diaphragms Only)	2
2	050-027-354	Ball, Check	4	19	360-100-379	Gasket, Air Inlet	1
	050-027-357	Ball, Check	4	20	360-108-360	Gasket, Pilot Valve	1
	050-027-360	Ball, Check	4	21	360-102-360	Gasket, Air Valve	1
	050-022-600	Ball, Check	4	22	518-138-502	Manifold, NPT	2
3	095-116-000	Pilot Valve Assembly	1		518-138-502E	Manifold, BSPT (Tapered)	2
4	114-023-157	Bracket, Intermediate	1	23	530-035-000	Muffler, Metal (not used with 031-191-001)	1
5	115-140-115	Bracket, Mounting	2	24	544-005-115	Nut, Flanged 5/16-18	24
6	132-034-360	Bumper, Diaphragm	2	25	560-001-360	O-ring	2
7	135-036-506	Bushing, Plunger	2	26	612-091-502	Plate, Outer Diaphragm	2
8	165-110-157	Cap, Air Inlet	1	27	612-177-330	Plate, Inner Diaphragm	2
9	171-062-115	Capscrew, Flanged 5/16-18 X 1.00	12		612-221-330	Plate, Inner Diaphragm (use with 286-116-000)	2
10	171-063-115	Capscrew, Flanged 5/16-18 X 1.25	36	28	620-019-115	Plunger, Actuator	2
11	171-076-115	Capscrew, Flanged 1/4-20 X 1.50	4	29	675-042-115	Ring, Retaining	2
12	171-077-115	Capscrew, Flanged 1/4-20 X .75	4	30	685-056-120	Rod, Diaphragm	1
13	196-178-502	Chamber, Outer	2	31	720-012-360	Seal, Diaphragm Rod	2
14	286-095-354	Diaphragm	2	32	720-045-600	Seal, Manifold	4
	286-095-357	Diaphragm	2	33	722-099-600	Seat, Check Valve	4
	286-095-360	Diaphragm	2	34	920-025-000	Grounding Cable	1
	286-116-000	Diaphragm, One-Piece Bonded	2				
15	286-096-600	Diaphragm, Overlay	2				
16	312-106-502	Elbow, Suction	2				

Air Distribution Valve Assembly Drawing



MAIN AIR VALVE ASSEMBLY PARTS LIST			
ITEM	PART NUMBER	DESCRIPTION	QTY
1	031-191-001	Valve Assembly	1
1-A	031-132-000	Sleeve and Spool Set	1
1-B	095-106-157	Valve Body	1
1-C	132-038-357	Bumper	2
1-D	165-128-157	End Cap	2
1-E	171-076-115	Hex Flange Capscrew 1/4-20 x .75	8
1-F	560-101-360	O-ring	4
1-G	530-030-550	Muffler	1
1-H	165-109-503	Muffler Cap	1
1-I	706-027-115	Machine Screw 6-32 x 1.25	4

MAIN AIR VALVE ASSEMBLY PARTS LIST			
(For pumps equipped with metal muffler or piped exhaust)			
1	031-186-003	Valve Assembly	1
(Same as above 031-191-001 minus items 1-G, 1-H, and 1-I)			

AIR DISTRIBUTION VALVE SERVICING

To service the air valve first shut off the compressed air, bleed pressure from the pump, and disconnect the air supply line from the pump.

Step #1: See COMPOSITE REPAIR PARTS DRAWING.

Using a 3/8" wrench or socket, remove the four hex capscrews (items 11). Remove the air valve assembly from the pump.

Remove and inspect gasket (item 22) for cracks or damage. Replace gasket if needed.

Step #2: Disassembly of the air valve.

Using a 3/8" wrench or socket, remove the eight hex capscrews (items 1-E) that fasten the end caps to the valve body. Next remove the two end caps (items 1-D). Inspect the two o-rings (items 1-F) on each end cap for damage or wear. Replace the o-rings as needed.

Remove the bumpers (items 1-C). Inspect the bumpers for damage or wear. Replace the bumpers as needed.

Remove the spool (part of item 1-A) from the sleeve. Be careful not to scratch or damage the outer diameter of the spool. Wipe spool with a soft cloth and inspect for scratches or wear.

Inspect the inner diameter of the sleeve (part of item 1-A) for dirt, scratches, or other contaminants. Remove the sleeve if needed and replace with a new sleeve and spool set (item 1-A).

Step #3: Reassembly of the air valve.

Install one bumper (item 1-C) and one end cap (item 1-D), with two o-rings (items 1-F), and fasten with four hex capscrews (items 1-E) to the valve body (item 1-B). Align hole in end cap with roll pin on valve body.

Remove the new sleeve and spool set (item 1-A) from the plastic bag. Carefully remove the spool from the sleeve. Install the six o-rings (item 1-F) into the six grooves on the sleeve. Apply a light coating of grease to the o-rings before installing the sleeve into the valve body (item 1-B), align the slots in the sleeve with the slots in the valve body. Insert the spool into the sleeve. Be careful not to scratch or damage the spool during installation. Install the remaining bumper and end cap (with o-rings), and fasten with the remaining hex capscrews. Align hole in end cap with roll pin on valve body.

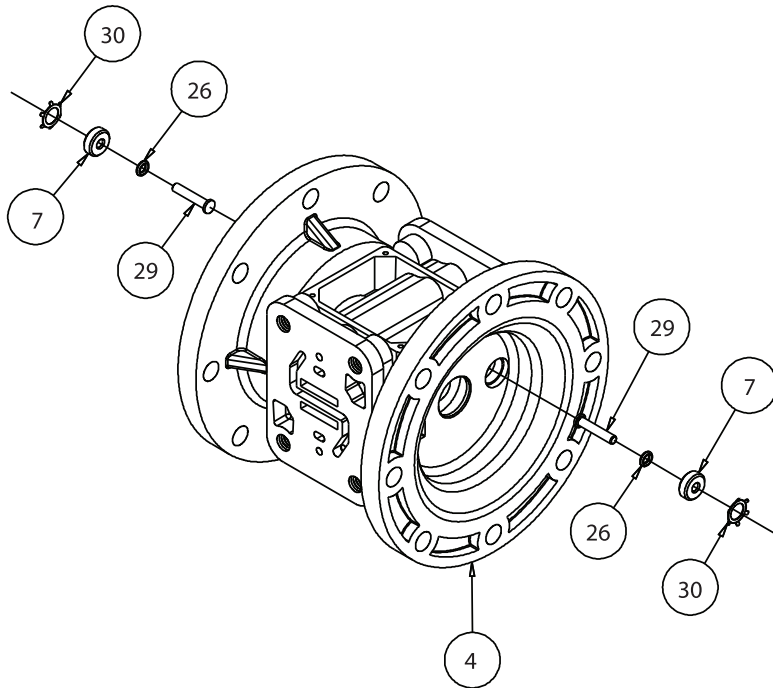
Fasten the air valve assembly (item 1) and gasket to the pump. Connect the air line to the pump. The pump is now ready for operation.



! IMPORTANT

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Intermediate Assembly Drawing



INTERMEDIATE REPAIR PARTS LIST

Item	Part Number	Description	Qty
4	114-023-157	Bracket, Intermediate	1
7	135-036-506	Bushing, Plunger	2
25	560-001-360	O-Ring	2
28	620-019-115	Plunger, Actuator	2
29	675-042-115	Ring, Retaining*	2

***Note:** It is recommended that when plunger components are serviced, new retaining rings be installed.

Intermediate Assembly Servicing

ACTUATOR PLUNGER SERVICING

To service the actuator plunger first shut off the compressed air supply, bleed the pressure from the pump, and disconnect the air supply line from the pump.

Step #1: See PUMP ASSEMBLY DRAWING.

Using a 3/8" wrench or socket, remove the four capscrews (items 12). Remove the air inlet cap (item 8) and air inlet gasket (item 19). The pilot valve assembly (item 3) can now be removed.

Step #2: Servicing the actuator plungers.

See PUMP ASSEMBLY DRAWING.

The actuator plungers (items 28) can be reached through the stem cavity of the pilot valve in the intermediate bracket (item 4). To service bushings, o-rings and retaining rings, see Intermediate Drawing.

Remove the plungers (items 28) from the bushings (item 7) in each end of the intermediate cavity. Inspect for wear or damage. Replace plunger as needed. Apply a light coating of grease to each o-ring and re-install the plungers in to the bushings. Push the plungers in as far as they will go.

Step #3: Re-install the pilot valve assembly into the intermediate assembly.

Be careful to align the ends of the stem between the plungers when inserting the stem of the pilot valve into the cavity of the intermediate.

Re-install the gasket (item 19), air inlet cap (item 8) and capscrews (items 12).

Connect the air supply to the pump. The pump is now ready for operation.

PLUNGER BUSHING, O-RING, AND RETAINING RING SERVICING

To service the plunger bushing components first remove the two retaining rings (items 29) using a small flat screwdriver. ***Note:** It is recommended that new retaining rings be installed.

Next remove the two plunger bushings (items 7). Inspect the bushings for wear or scratches. Replace the bushings as necessary.

Inspect the two o-rings (25) for cuts and/or wear.

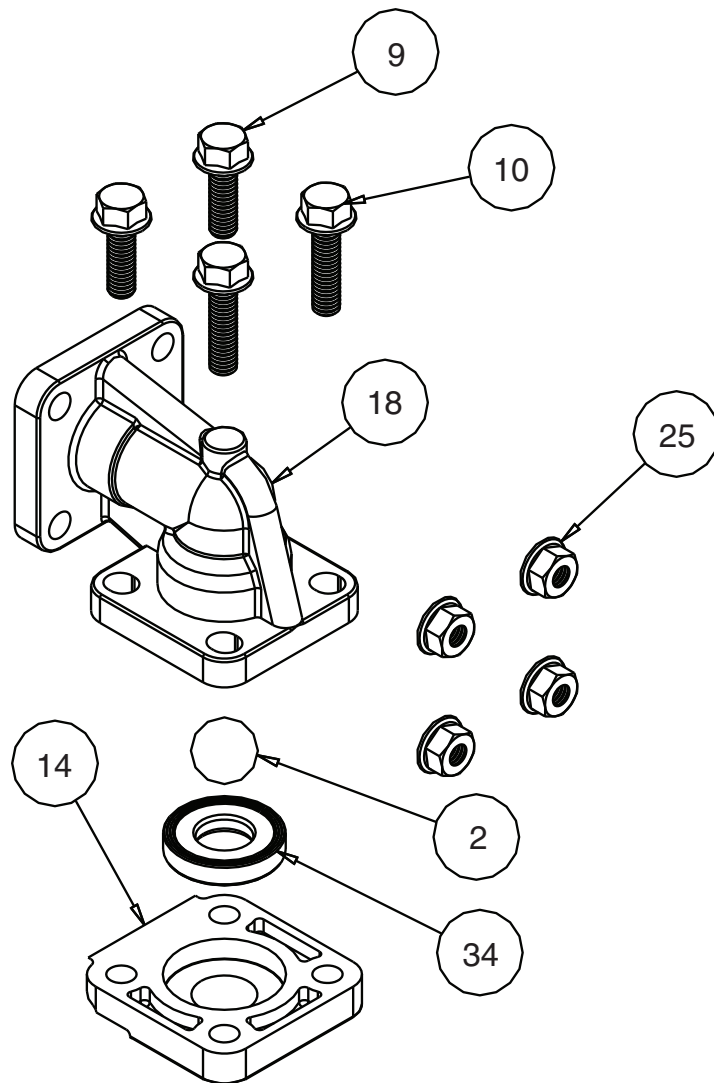


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Check Ball Valve Drawing



MODULAR CHECK BALL VALVE SERVICING

Before servicing the check valves, first shut off the suction line and then the discharge line to the pump. Next, shut off the compressed air supply, bleed air pressure from the pump, and disconnect the air supply line from the pump. Drain any remaining fluid from the pump. The pump can now be removed for service.

To access the modular check valve, remove the elbows (items 16 and 17 from pump composite repair parts drawing). Use a 1/2" wrench or socket to remove the fasteners. Once the elbows are removed, the modular check valves can be seen in the cavities of the outer chamber (items 13).

Inspect the check balls (items 2) for wear, abrasion, or cuts on the spherical surface. The check valve seats (items 33) should be inspected for cuts, abrasive wear, or embedded material on the surfaces of both the external and internal chamfers. The spherical surface of the check balls must seat flush to the surface of the inner chamfer on the check valve seats for the pump to operate to peak efficiency. Replace any worn or damaged parts as necessary.

RE-ASSEMBLE THE CHECK VALVE

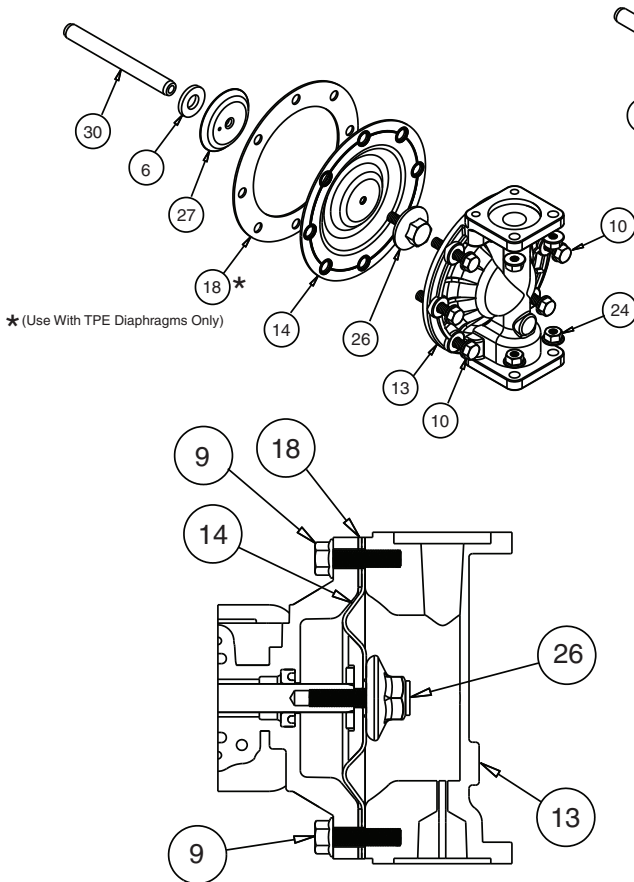
Place a check ball (item 2) in the ball cage of either the discharge elbow or the outer chamber. Install a check valve seat in the counter on each end of the chamber. Refasten the elbows to the chamber.



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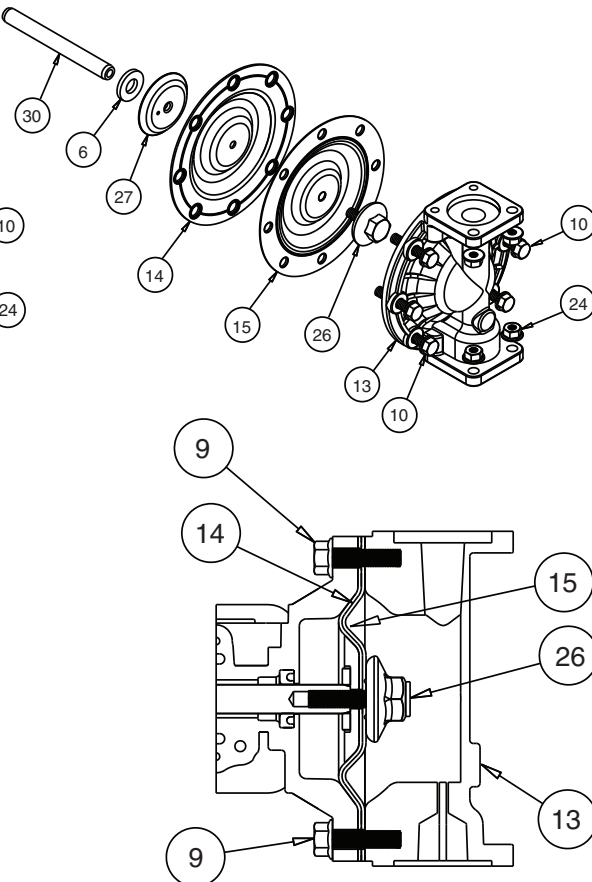
Diaphragm Service Drawing



★ (Use With TPE Diaphragms Only)

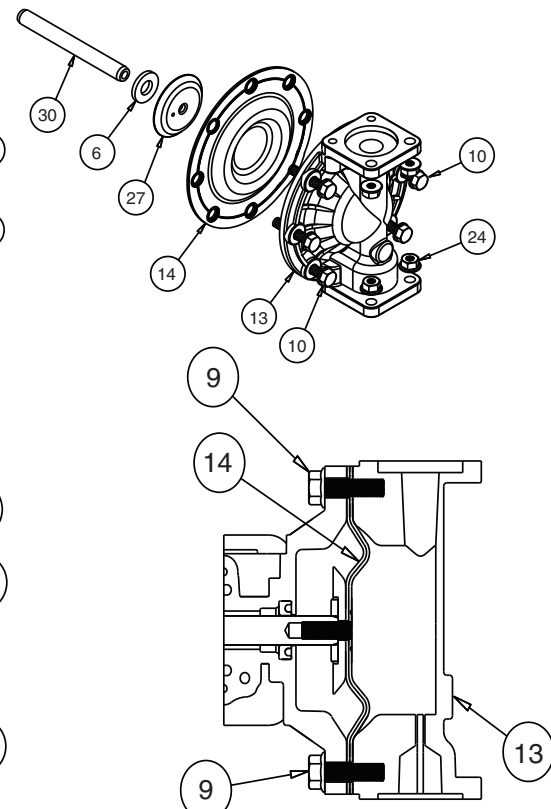
Diaphragm Orientation
Install diaphragm and spacer
as shown above

Diaphragm Service Drawing,
with Overlay



Diaphragm Orientation
Install diaphragm and overlay
as shown above.

Diaphragm Service Drawing
with One-Piece Bonded



Diaphragm Orientation
Install diaphragm (286.116.000
as shown above.

DIAPHRAGM SERVICING

To service the diaphragms first shut off the suction, then shut off the discharge lines to the pump. Shut off the compressed air supply, bleed the pressure from the pump, and disconnect the air supply line from the pump. Drain any remaining liquid from the pump.

Step #1: See the pump composite repair parts drawing, and the diaphragm servicing illustration.

Using a 1/2" wrench or socket, remove the 16 capscrews (items 9 & 10), and flanged nuts that fasten the elbows (items 17 and 18) to the outer chambers (items 14). Remove the elbows with the manifolds and spacers attached.

Step #2: Removing the outer chambers.

Using a 1/2" wrench or socket, remove the 16 capscrews (items 11 and 13), and flanged nuts that fasten the outer chambers, diaphragms, and intermediate (item 4) together.

Step #3: Removing the diaphragm assemblies.

Use a 3/4" (19mm) wrench or six pointed socket to remove the diaphragm assemblies (outer plate, diaphragm, and inner plate) from the diaphragm rod (item 32) by turning counterclockwise.

Insert a 6-32 set screw into the smaller tapped hole in the inner diaphragm plate (item 28). Insert the protruding stud and the 6-32 fastener loosely into a vise. Use a 3/4" wrench or socket to remove the outer diaphragm plate (item 27) by turning counterclockwise. Inspect the diaphragm (item 15) for cuts, punctures, abrasive wear or chemical attack. Replace the diaphragms if necessary.

Step #4: Installing the diaphragms.

Push the threaded stud of the outer diaphragm plate through the center hole of the diaphragm. Thread the inner plate clockwise onto the stud. Insert the loose assembly with the above 6-32 fastener back into the vise. Use a torque wrench to tighten the diaphragm assembly together to 90 in lbs. (10.17 Newton meters) 120 in lbs. Santoprene (13.56 Newton meters). Allow a minimum of 15 minutes to elapse after torquing, then re-torque the assembly to compensate for stress relaxation in the clamped assembly.

Step #5: Installing the diaphragm assemblies to the pump.

Make sure the bumper (item 6) is installed over the diaphragm rod.

Thread the stud of the one diaphragm assembly clockwise into the tapped hole at the end of the diaphragm rod (item 31) until the inner diaphragm plate is flush to the end of the rod. Insert rod into pump.

Align the bolt holes in the diaphragm with the bolt pattern in the intermediate (item 4).

Fasten the outer chamber (item 14) to the pump, using the capscrews (items 11 and 13) and flanged nuts.

On the opposite side of the pump, pull the diaphragm rod out as far as possible. Make sure the bumper (item 6) is installed over the diaphragm rod.

Thread the stud of the remaining diaphragm assembly clockwise into the tapped hole at the end of the diaphragm rod (item 31) as far as possible and still allow for alignment of the bolt holes in the diaphragm with the bolt pattern in the inner chamber. Install diaphragms with convolutions facing towards center of pump. See sectional view on previous page.

Fasten the remaining outer chamber (item 14) to the pump, using the capscrews (items 11 and 13) and flanged nuts.

Step #6: Re-install the elbow/ spacer/manifold assemblies to the pump, using the capscrews (items 9 & 10) and flanged nuts.

The pump is now ready to be re-installed, connected and returned to operation.

OVERLAY DIAPHRAGM SERVICING

The overlay diaphragm (item 16) is designed to fit snugly over the exterior of the standard TPE diaphragm (item 15).

ONE PIECE DIAPHRAGM SERVICING (Bonded PTFE with integral plate)

The One Piece diaphragm has a treaded stud installed in the integral plate at the factory. The inner diaphragm plate has a through hole instead of a threaded hole.

Place the inner plate over the diaphragm stud and thread the first diaphragm / inner plate onto the diaphragm rod only until the inner plate contacts the rod. Do not tighten.

A small amount of grease may be applied between the inner plate and the diaphragm to facilitate assembly.

Insert the diaphragm / rod assembly into the pump and install the outer chamber. Turn the pump over and thread the second diaphragm / inner plate onto the diaphragm rod. Turn the diaphragm until the inner plate contacts the rod and hand tighten the assembly. Continue tightening until the bolt holes align with the inner chamber holes. **DO NOT LEAVE THE ASSEMBLY LOOSE.**



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PUMPING HAZARDOUS LIQUIDS

When a diaphragm fails, the pumped liquid or fumes enter the air end of the pump. Fumes are exhausted into the surrounding environment. When pumping hazardous or toxic materials, the exhaust air must be piped to an appropriate area for safe disposal. See illustration #1 at right.

This pump can be submerged if the pump materials of construction are compatible with the liquid being pumped. The air exhaust must be piped above the liquid level. See illustration #2 at right. Piping used for the air exhaust must not be smaller than 1/2" (2.54 cm) diameter. Reducing the pipe size will restrict air flow and reduce pump performance. When the pumped product source is at a higher level than the pump (flooded suction condition), pipe the exhaust higher than the product source to prevent siphoning spills. See illustration #3 at right.

CONVERTING THE PUMP FOR PIPING THE EXHAUST AIR

The following steps are necessary to convert the pump to pipe the exhaust air away from the pump.

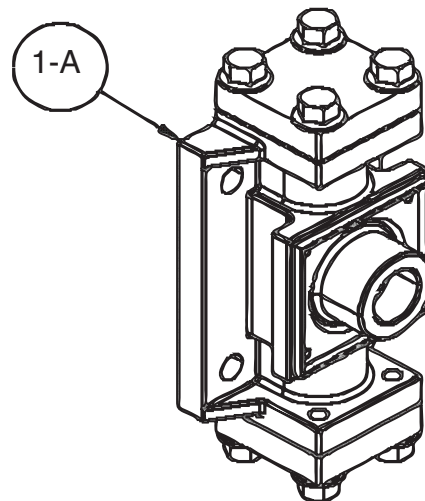
Use a Phillips screwdriver to remove the four machine screws (item 1-l).

Remove the muffler cap and muffler. The air distribution valve body has 3/8" NPT threads for installation of metal muffler or piped exhaust.

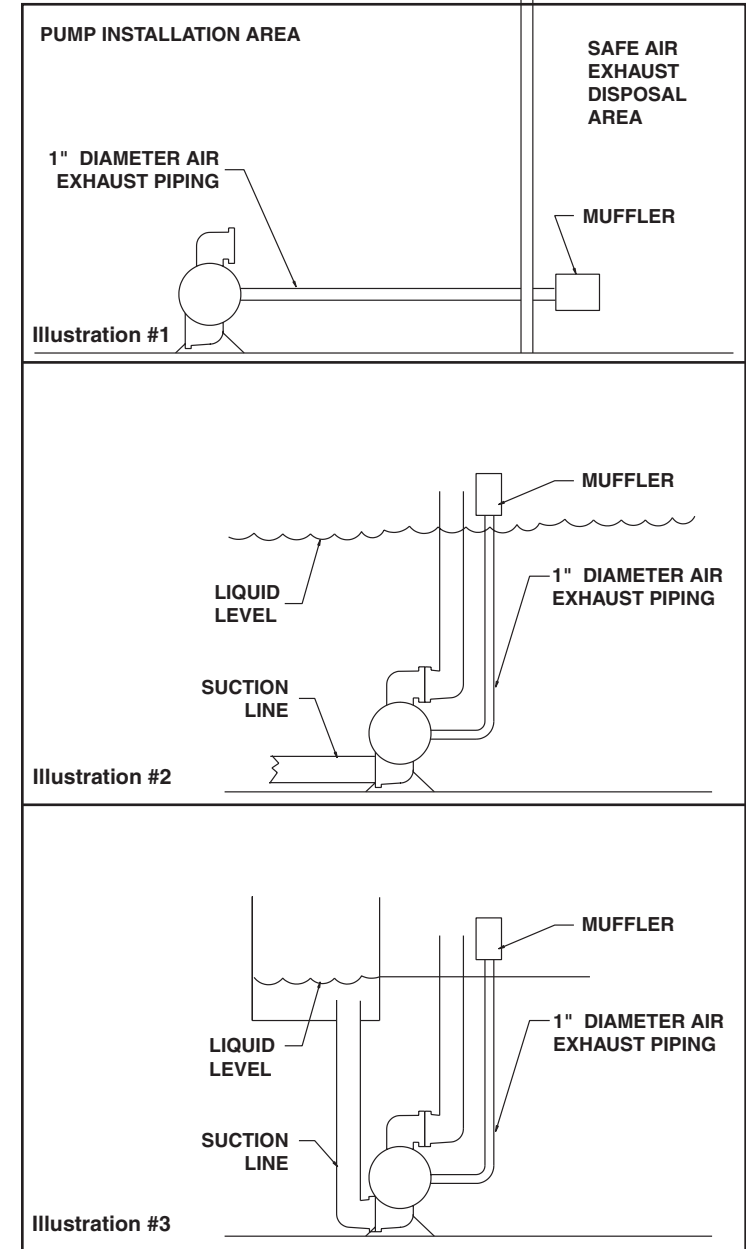
IMPORTANT INSTALLATION NOTE:

The manufacturer recommends installing a conductive flexible hose or connection between the pump and any rigid plumbing. This reduces stresses on the molded plastic threads of the air exhaust port. Failure to do so may result in damage to the air distribution valve body.

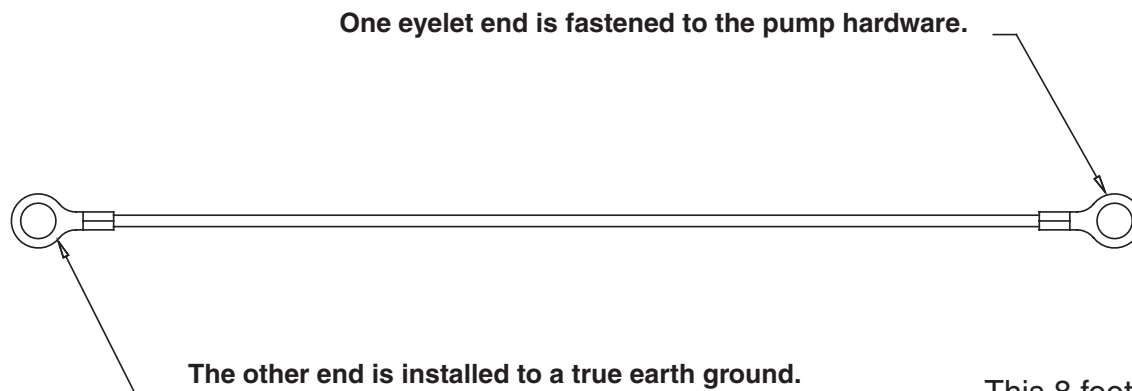
Any piping or hose connected to the pump's air exhaust port must be groundable and physically supported. Failure to support these connections could also result in damage to the air distribution valve body.



CONVERTED EXHAUST ILLUSTRATION

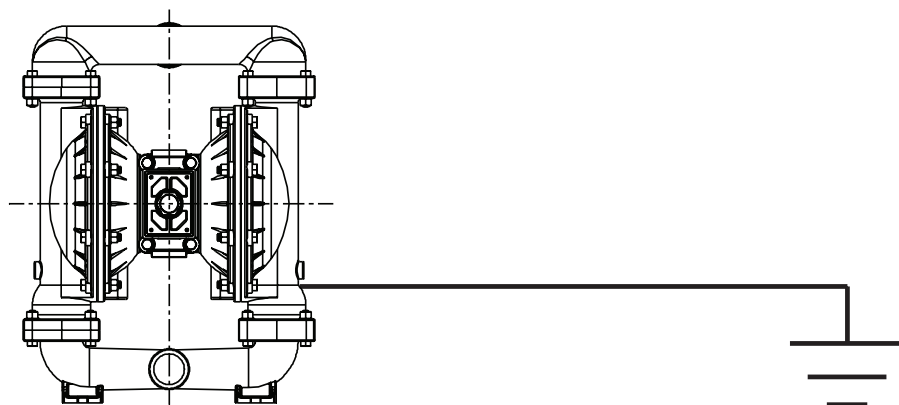


Grounding The Pump



This 8 foot long (244 centimeters) Ground Strap (Item 34) is shipped with the eyelet end fastened to the pump hardware.

To reduce the risk of static electrical sparking, this pump must be grounded. Check the local electrical code for detailed grounding instruction and the type of equipment required.



	! WARNING <i>Take action to prevent static sparking. Fire or explosion can result, especially when handling flammable liquids. The pump, piping, valves, containers or other miscellaneous equipment must be grounded.</i>
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Declaration of Conformity

**WARREN
RUPP®**

IDEX
FLUID & METERING

Declaration of Conformity

Warren Rupp, Inc., 800 North Main Street, Mansfield, Ohio, certifies that Air-Operated Double Diaphragm Pumps Series: HDB, HDF, M Non-Metallic, S Non-Metallic, M Metallic, S Metallic, Containment Duty, Gas, UL, High Pressure, W, Submersible and Tranquilizers comply with the European Community Directive 98/37/EC, Safety of Machinery. This product has used EN 809, Pumps and Pump Units for Liquids - Common Safety Requirements harmonized standard to verify conformance.

David Roseberry
Signature of authorized person

October 20, 2005

Date of issue

David Roseberry

Printed name of authorized person

Engineering Manager

Title

CE

Declaration of Conformity